

TECHNICAL MEMORANDUM 02

Date: June 9, 2021

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Pages: 7

Subject: English River Property Management – Stormwater Review

1.0 Background

1.1 Introduction

MPE Engineering Ltd. (MPE) was retained to review the sizing requirements and evaluate the conceptual stormwater pond design for the Grasswood Development for English River Property Management (ERPM). Additionally, the retention time of the existing average daily sanitary flows will be evaluated in the event that construction of the disposal work may follow the WWTF construction by up to two (2) years. This memorandum has been prepared to summarize the stormwater review and corresponding recommendations for retention and collection system design.

1.2 Scope of Work

The scope of work of this stormwater analysis is as follows:

- Review previous reports and stormwater analysis.
- Review City of Saskatoon Design and Development Standards Manual, Section 6 Storm Water Drainage System Version 13.
- Determine estimated runoff flows for 1:100 return period 24-hour storm.
- Calculate required storage volume of Storm Water Storage Basin based on estimated runoff flows.
- Provide conceptual design elements.
- Assess capacity of Storm Water Storage Basin to retain 2 years of existing sanitary flow.
- Provide budgetary cost estimate to complete the work.

1.3 Data Review

The following data, plans, reports, and manuals were compiled and reviewed to complete this memorandum:

- City of Saskatoon Design and Development Standards Manual, Section 6 Storm Water Drainage System; City of Saskatoon; Version 13
- Stormwater Guidelines; Water Security Agency; 2014
- Stormwater Report English River First Nation Grasswood, Saskatchewan; Clifton Associates; 2016
- Grasswood Development – Wastewater Treatment and Disposal Feasibility; Urban Systems; 2019
- English River Property Management Grasswood Wastewater Treatment Facility Effluent Disposal Strategy & DUIS; MPE Engineering Ltd.; 2020
- English River Property Management Wastewater Treatment Facility Design Basis Memorandum; MPE Engineering Ltd.; 2020

1.4 Site Location & Catchment

The development area consists of five phasing areas. Phase 1 has a total area of 4.02ha, Phase 2 has a total area of 4.03ha, Phase 3 has a total area of 3.01ha, Phase 4 has a total area of 2.87ha, and Phase 5 has a total area of 39.04ha. Phase 1 contains existing development and proposed Stage 1 current development, Phase 3 and Phase 4 contain proposed Stage 1 current development, while Phase 2 and Phase 5 contain proposed Stage 2 future development. The estimated contribution areas are summarized below:

Phases 1 through 5 Areas

- $A_1 = 4.02$ ha
- $A_2 = 4.03$ ha
- $A_3 = 3.01$ ha
- $A_4 = 2.87$ ha
- $A_5 = 39.04$ ha

2.0 Stormwater Pond Capacity Requirements

2.1 Methodology

Storm Water Storage Basin (major system) design typically involves ensuring sufficient storage volume is available to retain the volume of a 1:100 year return period event with no outflows present. Peak flows and storage volume have been estimated using a 24-hour design storm. Flows greater than the 1:100 year event have not been assessed as part of this project. The design also includes an allowance for storage of two days of maximum daily sanitary flow from the future planned development as an additional factor of safety.

2.2 Runoff Analysis

The contributing areas are less than 65 ha; therefore, the rational method was used to estimate the peak runoff and flow volumes. *The Water Security Agency Stormwater Guidelines* (EPB 322) as well as the *Saskatoon Design and Development Standards Manual* were used to develop the runoff coefficient for post-development scenarios. The IDF data for University of Saskatchewan and Saskatoon Airport was used for the storm intensity. The flows for the design area are summarized in Table 2.1.

Catchment	Catchment Area (ha)	Q (m ³ /s)			
		1:2 Return Period	1:5 Return Period	1:25 Return Period	1:100 Return Period
C		0.79	0.79	0.79	0.79
i, mm/hr		1.56	2.18	3.07	3.76
A1	4.0	0.01	0.02	0.03	0.03
A2	4.0	0.01	0.02	0.03	0.03
A3	3.0	0.01	0.01	0.02	0.02
A4	2.9	0.01	0.01	0.02	0.02
A5	39.0	0.13	0.19	0.26	0.32
TOTAL	53.0	0.18	0.25	0.36	0.44

The peak runoff from a 1:100-year event is estimated to be 0.44m³/sec based on a 24-hour storm. This flow includes all five phase areas after development. The required storage from the total catchment area is 37,877m³. Considering the runoff volume with 2 days of maximum daily flow, the required storage from the total catchment area is 39,029 m³. In the report prepared by Clifton Associates (2016), stormwater runoff volume was determined to be 38,414m³.

2.3 Existing Sanitary Flows

The English River Grasswood Development treated effluent flows were developed based on the existing and proposed development in the area. Existing treated effluent flows are based on the existing development in the Phase 1 area. Current flows are based on Stage 1 proposed development and existing development in Phase 1, Phase 3, and Phase 4. Future sanitary flows are based on Stage 2 proposed development, Stage 1 proposed development, and existing development in all phases. Existing, current, and future treated effluent maximum and average day flows are summarized in Table 2.2.

Period	Units	Max Day	Ave Day
Existing	m ³ /d	35	17.5
Current	m ³ /d	376	188
Future	m ³ /d	576	288

The existing development in Phase 1 will have average daily treated effluent flows of 17.5 m³/day. Based on the sizing of the catchment basin of 39,029m³, the proposed stormwater pond would provide 2,230 days of storage of existing treated effluent flow.

3.0 Conceptual Stormwater Pond Design

3.1 Proposed Location

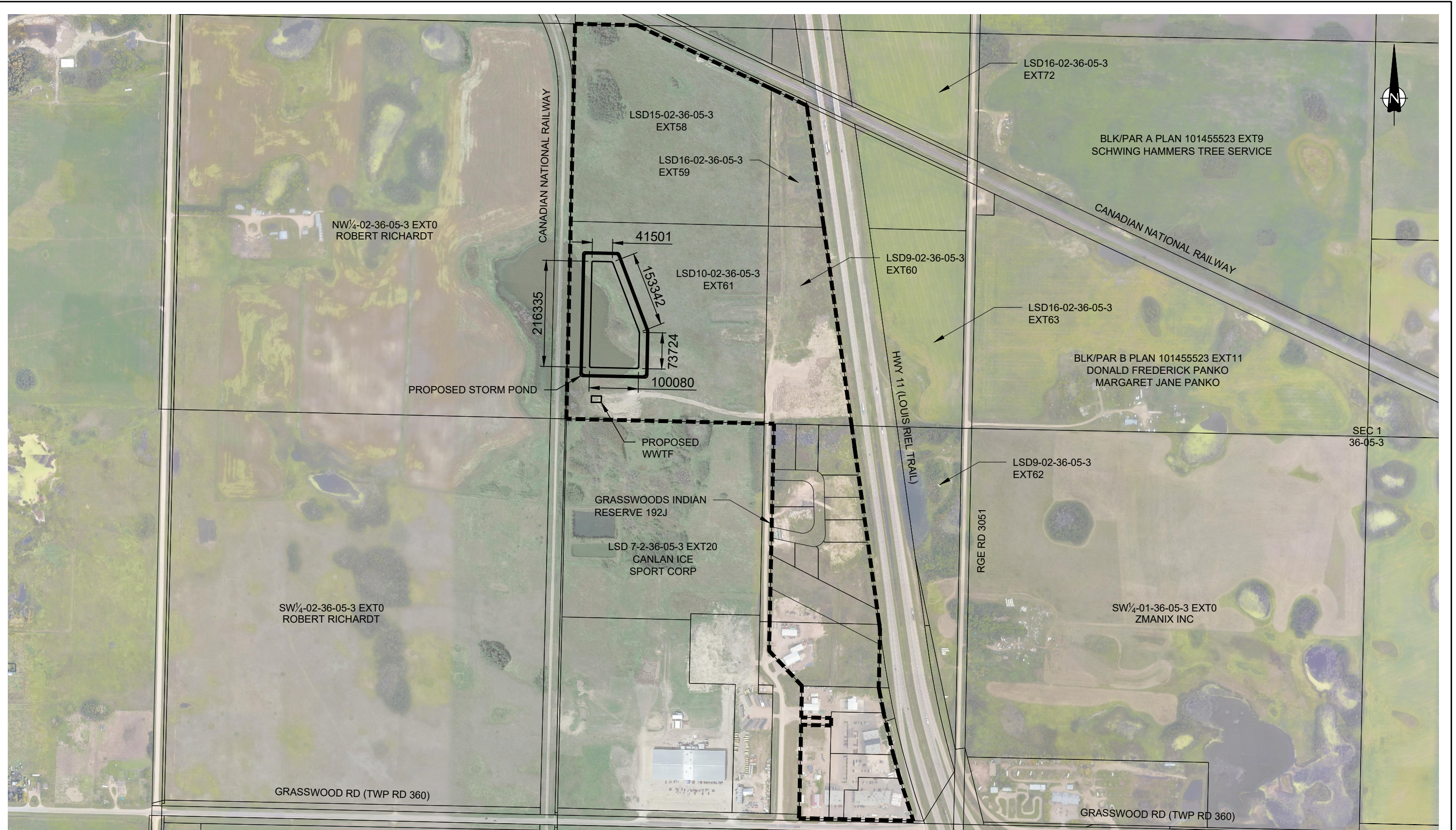
The location of the stormwater pond will be within the existing low-lying area located northwest of the proposed WWTF to minimize earthworks and capitalize on the natural topography. The stormwater pond will be tied into existing ground elevations on the east side. Embankments will be constructed as required along the perimeter.

3.2 Design overview

The proposed stormwater pond will be constructed in compliance with the City of Saskatoon Design and Development Standards Manual. Primary design elements that will be incorporated are as follows:

- Required freeboard of 1.0m.
- Depth no greater than 2.0m at full operating level.
- Length to width ratio between 4:1 to 5:1.
- Side slopes no steeper than 5:1.
- Bottom of pond graded with minimum slopes of 100:1.

The pond will also be constructed with a 400mm clay liner to prevent excessive exfiltration to the underlying aquifer. Embankments will be constructed with a 4.0 m wide driving lane on the top of banks. The retention pond will be connected to the WWTF to allow for initial storage of treated effluent for up to two (2) years, and to act as an emergency diversion cell after full buildout. At full build out, the lift station will be connected to the storm pond to allow the pond to be drawn down following storm events. Figure 1 illustrates the conceptual stormwater pond location and footprint.



ENGLISH RIVER PROPERTY MANAGEMENT
 WWTF - EFFLUENT DISPOSAL STUDY
 GRASSWOODS DEVELOPMENT
 STORM POND PLAN

SCALE: 1:7500

DATE: NOVEMBER 2020

JOB: 7603-003-00

FIGURE: 1.1

4.0 Capital Cost Estimate

The capital costs for the recommended improvements have been estimated and are summarized in Table 4.1. The following costs include contingency and engineering but do not include taxes.

Item	Description	Cost
1	Stormwater Pond Construction	\$ 448,000
3	Contingency (20%)	\$ 89,600
4	Engineering (12%)	\$ 64,512
TOTAL		\$ 602,000

The capital costs for the recommended improvements have been estimated in 2021 dollars. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. The estimates have been provided to assist English River with budgetary planning purposes only and should not be used as actual quotes. Refer to Appendix A for the complete details of the capital cost estimate.

5.0 Conclusions & Recommendations

5.1 Conclusions

The major findings of this report are summarized as follows:

- Stormwater catchment areas consist of Phase 1, Phase 2, Phase 3, Phase 4, and Phase 5 post development.
- The stormwater collection system requires a volume of 39,029m³ to retain the 1:100 year, 24 hour stormwater flows with two (2) days of future maximum day effluent flows from the WWTF.
- The proposed stormwater pond volume of 39,029m³ has sufficient capacity to retain 2,682 days of existing average daily treated effluent flows.

5.2 Recommendations

- Review this technical memorandum and its conclusions.
- Consider these findings when assessing/reviewing the proposed Storm Water Storage Basin design.

APPENDIX A

Detailed Cost Estimate



English River Stormwater Retention Pond

Preliminary Cost Estimate

DESCRIPTION	QUANTITY	UNIT	SUPPLY	INSTALL	COST
Division 0 & Division 1					
1 Mob/demob/bonding/insurance/profit	1	LS	\$ 40,000.00		\$ 40,000.00
SUBTOTAL					\$ 40,000.00
Division 2					
1 Site Work					
a) Topsoil Stripping	40,000	m ²	\$ 0.50		\$ 20,000.00
b) Common Excavation	21,000	m ³	\$ 4.00		\$ 84,000.00
c) Imported Fill	18,000	m ³	\$ 3.00		\$ 54,000.00
d) Waste Excavation	14,000	m ³	\$ 8.00		\$ 112,000.00
e) Compacted Embankment	20,000	m ³	\$ 4.00		\$ 80,000.00
f) Compacted Clay Liner	11,500	m ²	\$ 5.00		\$ 57,500.00
SUBTOTAL					\$ 408,000.00
GRAND SUBTOTAL					448,000.00
Contingency (20%)					\$ 89,600.00
Engineering Allowance (12%)					\$ 64,512.00
GRAND TOTAL					\$ 602,000.00